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NATIONAL DAM SAFETY PROGRAM. LAC-PIETE DAM (MO 10886), MISSOURI--ETC(U)
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MISSOURI-KANSAS CITY BASIN

LAC-PIETE DAM

CALLAWAY COUNTY, MISSOURI

MO 10886

AD A105308

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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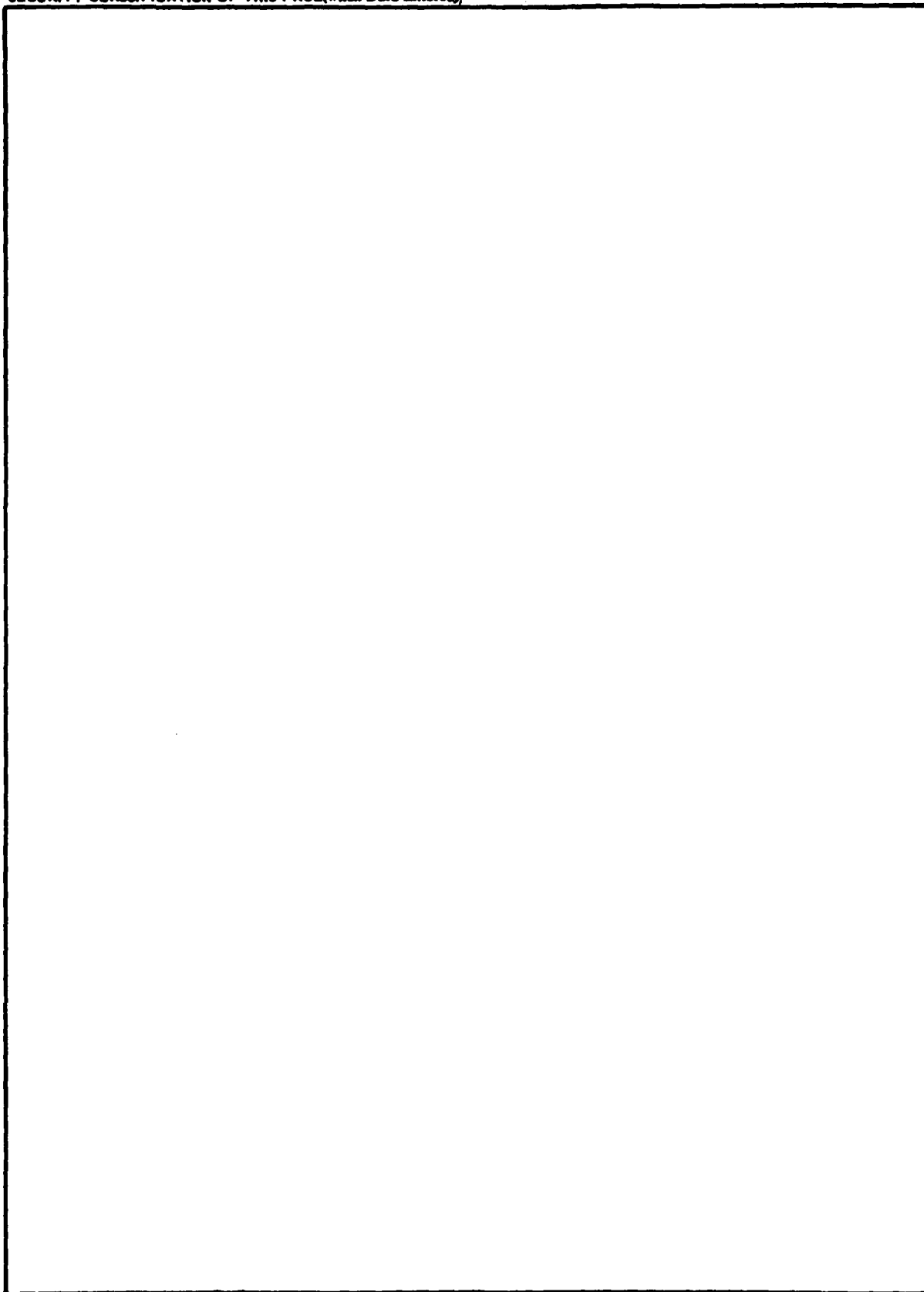
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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Lac-Piete Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Lac-Piete Dam. It was prepared under the National Program of Inspection of Non-Federal Dams.

SUBMITTED BY:

SIGNED

Chief, Engineering Division

9 FEB 1979

Date

APPROVED BY:

SIGNED

Colonel, CE, District Engineer

12 FEB 1979

Date

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAC-PIETE DAM
MO 10886

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

| | |
|--------------------|----------------------------|
| Name of Dam | Lac-Piete Dam |
| State Located | Missouri |
| County Located | Callaway County |
| Stream | Tributary to Stinson Creek |
| Date of Inspection | September 13, 1978 |

Lac-Piete Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderegger, Inc. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

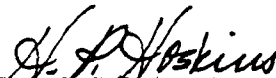
The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends two miles downstream of the dam. Within the damage zone are three farm houses and associated buildings and one county road.

Our inspection and evaluation indicates that in consideration of the small volume of water impounded and the three houses downstream, 50% of the Probable Maximum Flood is the appropriate design flood. The spillway of this dam does not meet this criteria. The spillway will pass the 100-year flood (flood having a one percent chance of being exceeded in any year) as well as 23% of the Probable Maximum Flood (PMF) without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.

Deficiencies visually observed by the inspection team were willows nearly covering the upstream slope, wave erosion of the upstream slope above the water line at the left end of the dam, downstream slope badly overgrown with shrubs and trees, significant seepage along the downstream toe of the dam (Sta. 1+00 to Sta. 4+50), erosion around the outlet end of the spillway pipe, willows growing around the inlet to the spillway and heavy growth of trees in the channel downstream of the dam.

Several items of preventive maintenance need to be initiated by the owner. These are described in detail in the body of the report.



Harold P. Hoskins, P.E.
Hoskins-Western-Sonderregger, Inc.
Lincoln, Nebraska



PHOTO NO. 1
OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAC-PIETE DAM-MO 10886
CALLAWAY COUNTY, MISSOURI
SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Lac-Piete Dam be made.
- b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.
- c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many State agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances
 - (1) The dam is an earth fill about 500 feet long and 22 $\frac{1}{2}$ feet high. Topography adjacent to the site is rolling to moderately steep. Materials exposed on the slopes are highly plastic (CH) and are probably developed from cherty limestone.
 - (2) The principal spillway consists of an 18 inch diameter ungated corrugated metal pipe passing through the embankment on the right (east) end of the dam.
 - (3) Pertinent physical data are given in paragraph 1.3.
- b. Location. The dam is located in the west central portion of Callaway County, Missouri, as shown on Plate A2. The dam and the lake formed by the dam is shown on Plate A-1 in the SW $\frac{1}{4}$ of Section 7, T47N, R9W.
- c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the small size category.

Although the size and storage of Lac-Piete Dam are marginal as far as the small size classification is concerned, the dam was included in the inspection program due to its high downstream hazard potential and the fact the size and storage of Lac-Piete are significant when compared to the size requirements of the program.

- d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends two miles downstream of the dam. Within the damage zone are three farm houses and associated buildings and one county road.
- e. Ownership. The dam is owned by the Christopher Subdivision, c/o J.D. McDonald, Route 6, Fulton, Missouri 65251.
- f. Purpose of Dam. The dam forms a 3 acre recreational lake.
- g. Design and Construction History. No design or construction records were available. The dam was reportedly built in 1966 or 1967.
- h. Normal Operating Procedures. There are no controlled outlets for this dam. No information was available on the frequency or duration of spillway operation.

1.3 PERTINENT DATA

- a. Drainage Area - 34 acres.
- b. Discharge at Damsite.
 - (1) All discharge at the damsite is through an ungated corrugated metal pipe spillway.
 - (2) Estimated maximum flood at damsite - unknown.
 - (3) The spillway capacity varies from 0 c.f.s. at elevation (808.7) to 15 c.f.s. at the minimum elevation (812.2) of the dam top.
- c. Elevation (Feet Above M.S.L.)
 - (1) Top dam - 812.7± (Average) - 812.2± (Minimum at Sta. 1+00).
 - (2) Principal spillway invert elevation - 808.7±(at Sta. 4+30±).
 - (3) Streambed at centerline of dam - 790±.
 - (4) Maximum tailwater - unknown.
- d. Reservoir. Length of maximum pool - 500 feet±.
- e. Storage (Acre - feet). Top of dam - 28.

f. Reservoir Surface (Acres).

- (1) Top of dam - 5 acres±.
- (2) Spillway invert elevation - 3 acres±.

g. Dam

- (1) Type - earth embankment
- (2) Length - 500 feet±.
- (3) Height - 22 feet±.
- (4) Top width - 24 feet±.
- (5) Side Slopes
 - (a) Downstream - 2.3H on 1V (Measured)
 - (b) Upstream - 3H on 1V (measured on exposed slope)
- (6) Zoning - unknown.
- (7) Impervious Core - unknown.
- (8) Cutoff - unknown.
- (9) Grout Curtain - unknown.
- (10) Wave Protection - none.

h. Diversion and Regulating Tunnel. None.

i. Spillway

- (1) Type - 18" diameter ungated corrugated metal pipe.
- (2) Length of pipe - 39 feet.
- (3) Inlet invert elevation - 808.7 feet M.S.L.
Outlet invert elevation - 808.6 feet M.S.L.
- (4) Upstream channel - Many willows were found growing in upstream channel.
- (5) Downstream channel - Many willows and small trees found in downstream channel.

j. Regulating Outlets. None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were available for this dam.

2.2 CONSTRUCTION

The dam was constructed in 1966 or 1967. No other construction data were available.

2.3 OPERATION

There are no control outlets for this dam.

2.4 EVALUATION

- a. Availability. No engineering data were available.
- b. Adequacy. Seepage and stability analyses comparable to the requirements of the 'Recommended Guidelines for Safety Inspection of Dams' were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.
- c. Validity. Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

- a. General. A visual inspection of the Lac-Piete Dam was made on September 13, 1978. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska making the inspection were: Rey Decker, Geology and Soil Mechanics; Garold Ulmer, Civil Engineer; Richard Walker and Gordon Jamison, Hydrology. Specific observations are discussed below.
- b. Dam. The crest of the dam serves as an access road for the adjacent home development area. Rough measurements, (see Appendix C) along the crest indicate that the right end of the dam is about 2 feet lower in elevation than the remainder of the dam. The upstream slope is nearly covered with willows from about Station 2+00 to the right end. Some wave erosion was noted on the upstream slope above the present water line on the left end of the dam (Q Station 0+00 to 2+00).

The downstream slope is badly overgrown with shrubs and trees up to 5 inches in diameter. A number of drying cracks were noted on the downstream slope and on the crest of the dam. No other significant cracks, slides or abnormal deformations were noted on the embankment. Materials exposed in the left abutment downstream from the dam consisted of highly plastic clay (CH). No slides or seepage were noted in the abutments.

Significant seepage was noted along the downstream toe of the dam from about Q Station 1+00 to 4+50. No boils were observed and seepage appeared to be clear. An 8 inch cast iron sewer line runs along the toe of the dam (approximately Q Stations 5+00 to 3+00)

An 8 inch cast iron sewer line, serving the homes on the right (east) side of the dam and lake, runs along the downstream toe of the dam between approximate Q stations 5+00 to 3+00. Another 8 inch sewer line serving the left (west) side of the lake empties into an open manhole at the toe of the dam downstream from about Q station 1+00. (See Photo No. 10). Both of the sewer lines outlet into the sewage lagoon located immediately downstream from the dam.

- c. Appurtenant Structures. The spillway is located on the right abutment. It is uncontrolled and consists of an 18 inch corrugated metal pipe about 39 feet long passing through the embankment. The spillway outlets into a poorly defined earth channel running down the slope of the dam. Some erosion was noted at the outlet of the spillway pipe. Several willows are growing around the inlet to the spillway.

- d. Reservoir Area. No wave wash, excessive erosion or slides were noted along the shore of the reservoir.
- e. Downstream channel. The old stream channel is heavily wooded downstream from the dam.
- f. Downstream Hazards. Two sewage lagoons are located downstream from the dam, one of which is only about 25 feet from the toe of the dam at about $\frac{1}{2}$ Station 3+00.

3.2 EVALUATION

The tree growth on both slopes of the dam could lead to potential of failure if left uncontrolled. Erosion at the outlet of the spillway could ultimately lead to potential of failure and damage to the sewer line serving the right (east) side of the lake. Additional studies would be required to determine the affects of seepage on the stability of the structure.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlets for this dam.

4.2 MAINTENANCE OF DAM

The number and size of trees growing on both slopes indicates that there is no regular maintenance program in effect for this dam.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

The inspection team is not aware of any warning system in effect at this dam.

4.5 EVALUATION

Trees growing on both slopes of the dam and erosion in the outlet channel of the spillway could lead to potential of failure if left uncontrolled.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. Design Data. No hydraulic and hydrologic data were furnished by the owner. Therefore all computations are based on field inspection and surveys by the consultant. The plan, profiles, and cross sections from the survey are attached in Appendix C.
- b. Experience. The drainage area and contour surface areas are developed from the U.S.G.S. Fulton, Missouri (7.5') Quadrangle. The spillway and dam layouts are from surveys made during inspection.
- c. Visual Observations.
- (1) The spillway pipe appeared to be in good condition.
 - (2) The spillway is located in the right abutment of the dam. Spillway releases flow along the downstream toe of the dam and into the old stream channel.
 - (3) Many willows and small trees in both the upstream and downstream channels.
 - (4) No drawdown facilities are available to evacuate the pool.
- d. Overtopping Potential. The spillway is too small to pass the probable maximum flood without overtopping. One-half the PMF will overtop the dam by 0.7 feet for a period of 5 1/2 hours. The spillway will pass the 0.23 PMF without overtopping. The existing spillway will pass the 100 year frequency flood without overtopping. The 0.23 PMF is approximately equal to the 100 year frequency flood. The results of the routings through the dam are tabulated in regards to the following conditions.

| Frequency | Inflow Discharge c.f.s. | Outflow Discharge c.f.s. | Maximum Pool Elevation | Freeboard Top of Dam Min. Elevation 812.2 | Time Dam Overtopping Hr. |
|-----------|-------------------------------|--------------------------------|------------------------------|--|-----------------------------------|
| 100 Yr. | 75 | 15 | 812.2 | 0 | 0 |
| 1/2 PMF | 176 | 174 | 812.9 | -0.7 | 5 1/2 |
| PMF | 352 | *361 | 813.1 | -0.9 | 8 1/2 |
| 0.23 PMF | 79 | 15 | 812.2 | 0 | 0 |

* Due to the inaccuracy of the stage - storage curve. See paragraph 4 in Appendix D.

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, 50% of the PMF is the test for the adequacy of the dam and its spillway.

The St. Louis District Corps of Engineers, in a letter dated 11 August, 1978 has estimated the damage zone as extending two miles downstream of the dam. Within the damage zone are three farm houses and associated buildings and one county road.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations. Visual observations which could affect the structural stability of this dam are discussed in Section 3. These include the following features: trees growing on both slopes of the embankment, erosion in the spillway outlet, seepage along the downstream toe of the dam.
- b. Design and Construction Data
No design or construction data were available.
- c. Operating Records. There are no operating facilities for this dam and no records of spillway operation were available.
- d. Post Construction Changes. The inspection team is not aware of any post construction changes on this dam.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Safety. Several items were noted during the visual inspection that could lead to potential of failure. These items include uncontrolled tree growth on both slopes of the dam and erosion on the upstream slope and in the spillway outlet. The slopes measured on this embankment should provide adequate safety against shear failure for a dam of this height. However, the seepage observed at the downstream toe could adversely affect the safety of the structure.

According to available data, the spillway will not pass 50% of the probable maximum flood (PMF) without overtopping the dam. The spillway will pass the 100 year flood and 23% of the PMF without overtopping.

- b. Adequacy of Information. No engineering or construction data were available for this dam. Conclusions in this report are based upon performance history and observations and measurements made during the visual inspection. The inspection team considers that this information is sufficient to support the conclusions herein. Neither seepage nor stability analyses were available which are deficiencies that should be corrected in the future.
- c. Urgency. There does not appear to be an immediate urgency to accomplish the remedial measures discussed in Paragraph 7.2.
- d. Necessity for Phase II. Phase II investigations are not considered necessary.
- e. Seismic Stability. The safety of this dam should not be adversely affected by an earthquake of the magnitude to be expected in this area.

7.2 REMEDIAL MEASURES

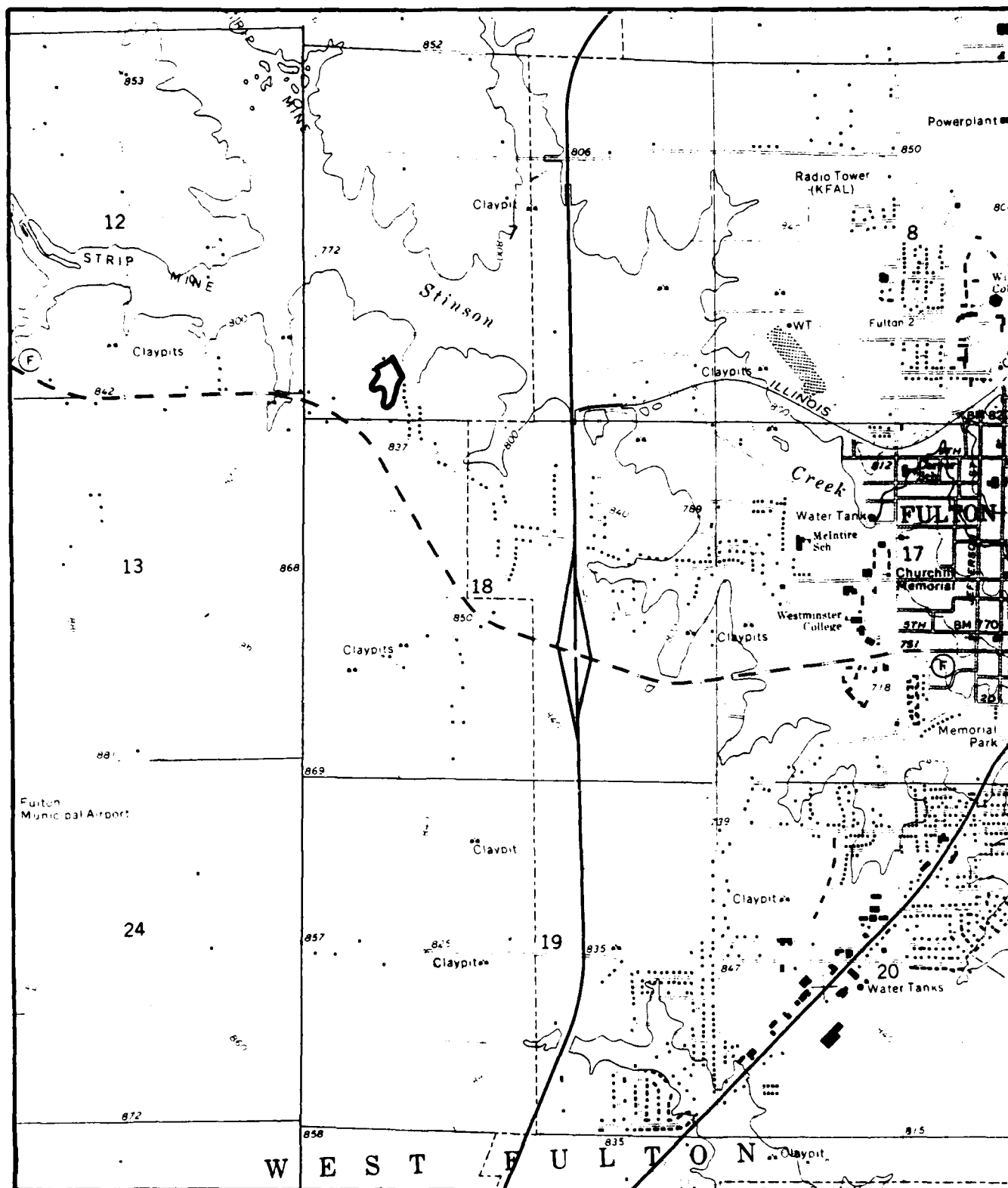
- a. Alternatives
 - (1) The size of the existing spillway should be increased or an emergency earth spillway should be constructed through one of the abutments to prevent overtopping of the dam by 50% of the probable maximum flood.
 - (2) Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams.

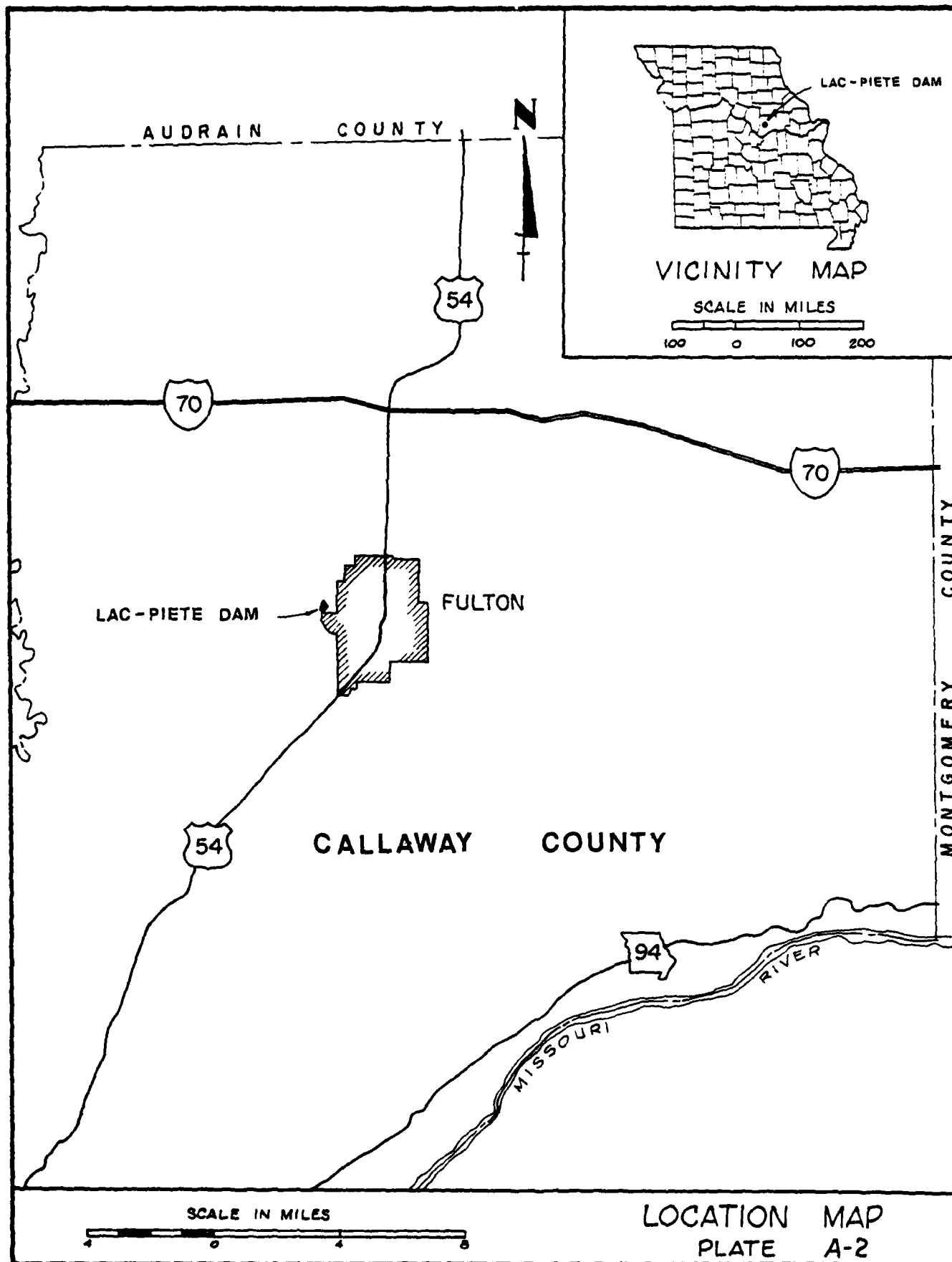
- (3) The services of an engineer experienced in the design of dams should be obtained to evaluate the hydraulic/hydrologic and the structural stability aspects of this dam and to design remedial measures that may be required.

b. O & M Maintenance and Procedures

- (1) Trees and heavy vegetation growing on the embankment should be removed.
- (2) The spillway outlet should be improved and stabilized against erosion.
- (3) Erosion on the upstream face of the dam should be corrected.
- (4) A program of regular inspection and maintenance should be initiated. The program should include inspection of all items which could adversely affect the stability of the dam. Records should be kept of all inspections, maintenance, and remedial measures accomplished.

APPENDIX A
MAPS





APPENDIX B
PHOTOGRAPHS



PHOTO NO. 2
LOOKING UPSTREAM
AT OUTLET END OF
CORRUGATED METAL
PIPE SPILLWAY

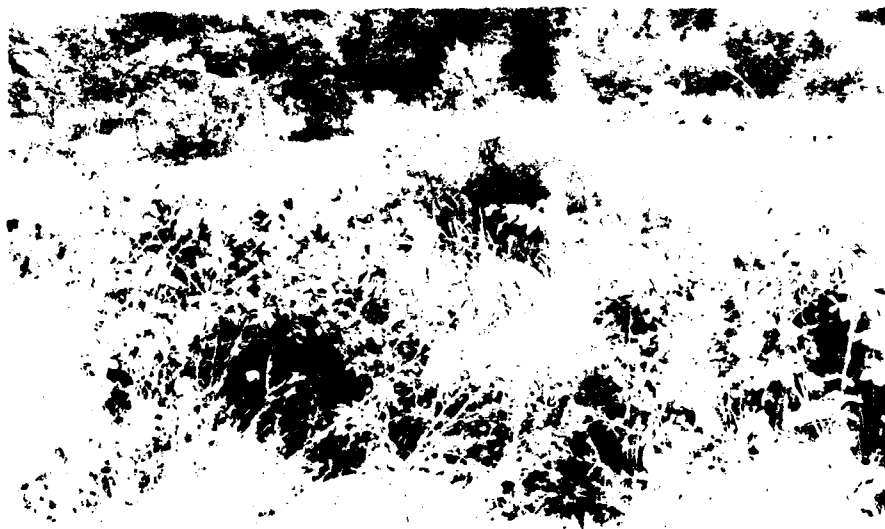


PHOTO NO. 3
LOOKING DOWNSTREAM
FROM RIGHT END OF DAM



PHOTO NO. 4
LOOKING WEST ALONG
DOWNSTREAM SLOPE
OF DAM.



PHOTO NO. 5
LOOKING WEST
ALONG DOWNSTREAM
SLOPE OF DAM.

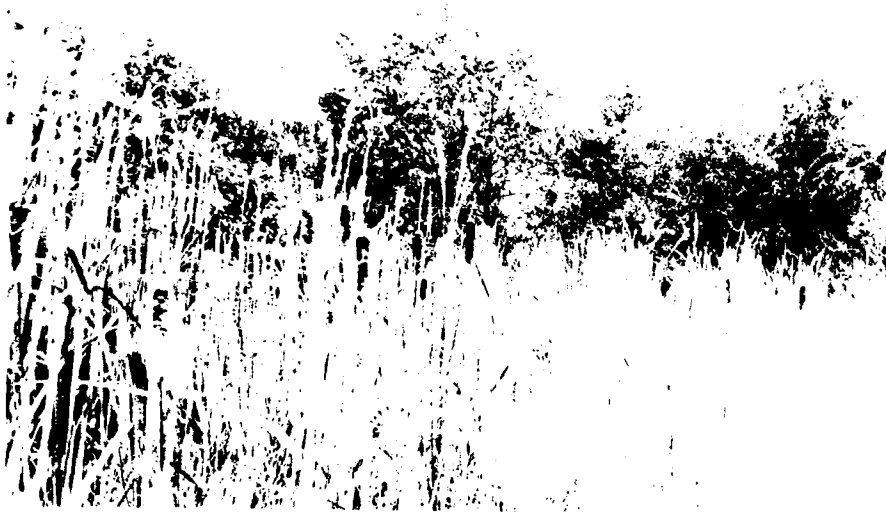


PHOTO NO. 6
SEEP AREA BELOW
CENTERLINE STA. 3+50.



PHOTO NO. 7
LOOKING ALONG
CENTERLINE OF
DAM FROM RIGHT
TO LEFT. COUNTY
ROAD CROSSES DAM.

PHOTO NO. 8
UPSTREAM SLOPE
FROM RIGHT SIDE.



PHOTO NO. 9
LOOKING DOWNSTREAM
FROM STA. 3+35 AT
SEWAGE LAGOON.



PHOTO NO. 10
SANITARY SEWER
OUTLET AT STA.
1+60.

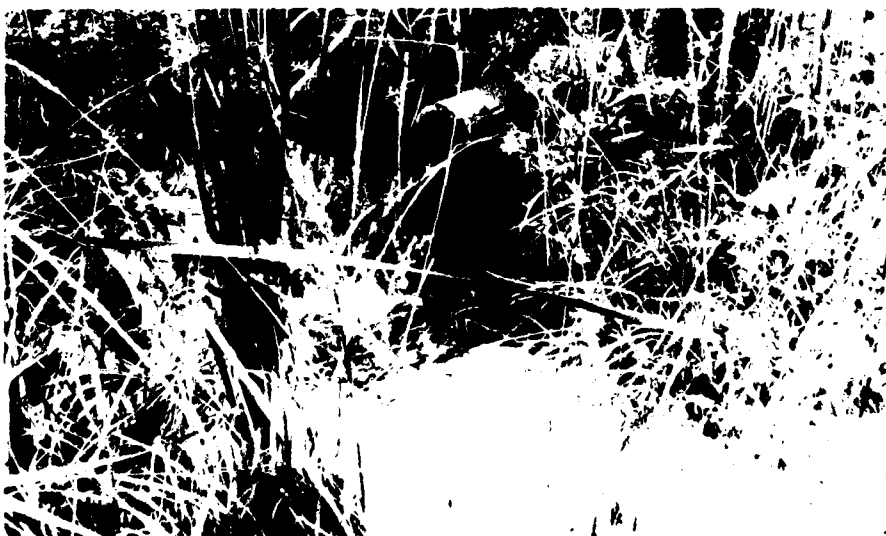


PHOTO NO. 11
DOWNSTREAM SLOPE
LOOKING FROM LEFT
TO RIGHT.



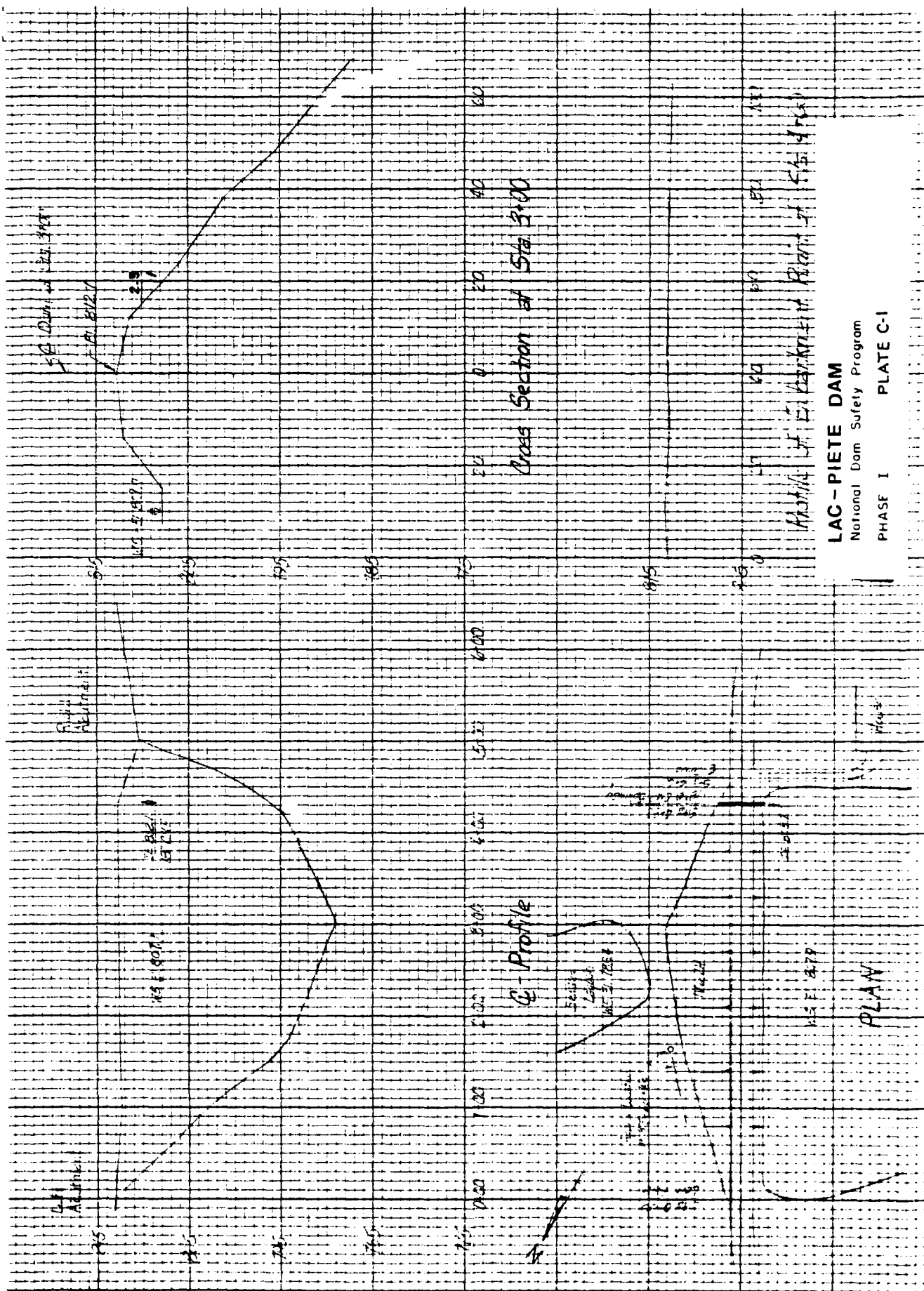
PHOTO NO. 12
UPSTREAM SLOPE
LOOKING FROM
LEFT TO RIGHT.



PHOTO NO. 13
TAKEN FROM TOP
OF DAM TO LEFT
AND UPSTREAM.



APPENDIX C
PLAN, PROFILES & SECTION



LAC-PIETE DAM

National Dam Safety Program

PHASE I PLATE C-1

Profile of Embankment at Sta 3+00

APPENDIX D
HYDROLOGIC COMPUTATIONS

HYDROLOGIC COMPUTATIONS

1. The Mockes dimensionless standard curvilinear unit hydrograph and the SCS TR-20 program were used to develop the inflow hydrographs (see Plate D1).
 - a. Twenty four-hour, 12-hour, and 6-hour 100-year rainfalls for the dam location were taken from NWS Technical Paper 40. The 24-hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current OCE directives furnished 4 August 1978 and formally stated in a letter dated 21 August 1978.
 - b. Drainage area = 0.05 square miles.
 - c. Time of concentration of runoff = 7 minutes.
 - d. The antecedent storm conditions were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMCIII). The initial pool elevation was assumed at the invert of the spillway.
 - e. The total 24-hour storm duration losses (interception, infiltration, and evapotranspiration) for the 100-year storm were 0.64 inches which is approximately a 0.23 PMF storm. The total losses for the 24-hour duration $\frac{1}{2}$ PMF storm were 0.66 inches. The total losses for the PMF storm were 0.72 inches. These data are based on SCS runoff curve No. 86 and antecedent moisture conditions from SCS AMCIII.
 - f. Average soil loss rates = 0.05 inch per hour approximately.
2. The combined discharge rating consisted of two components; the flow through the spillway and flow going over the top of the dam. The spillway rates are based on the full flow equation

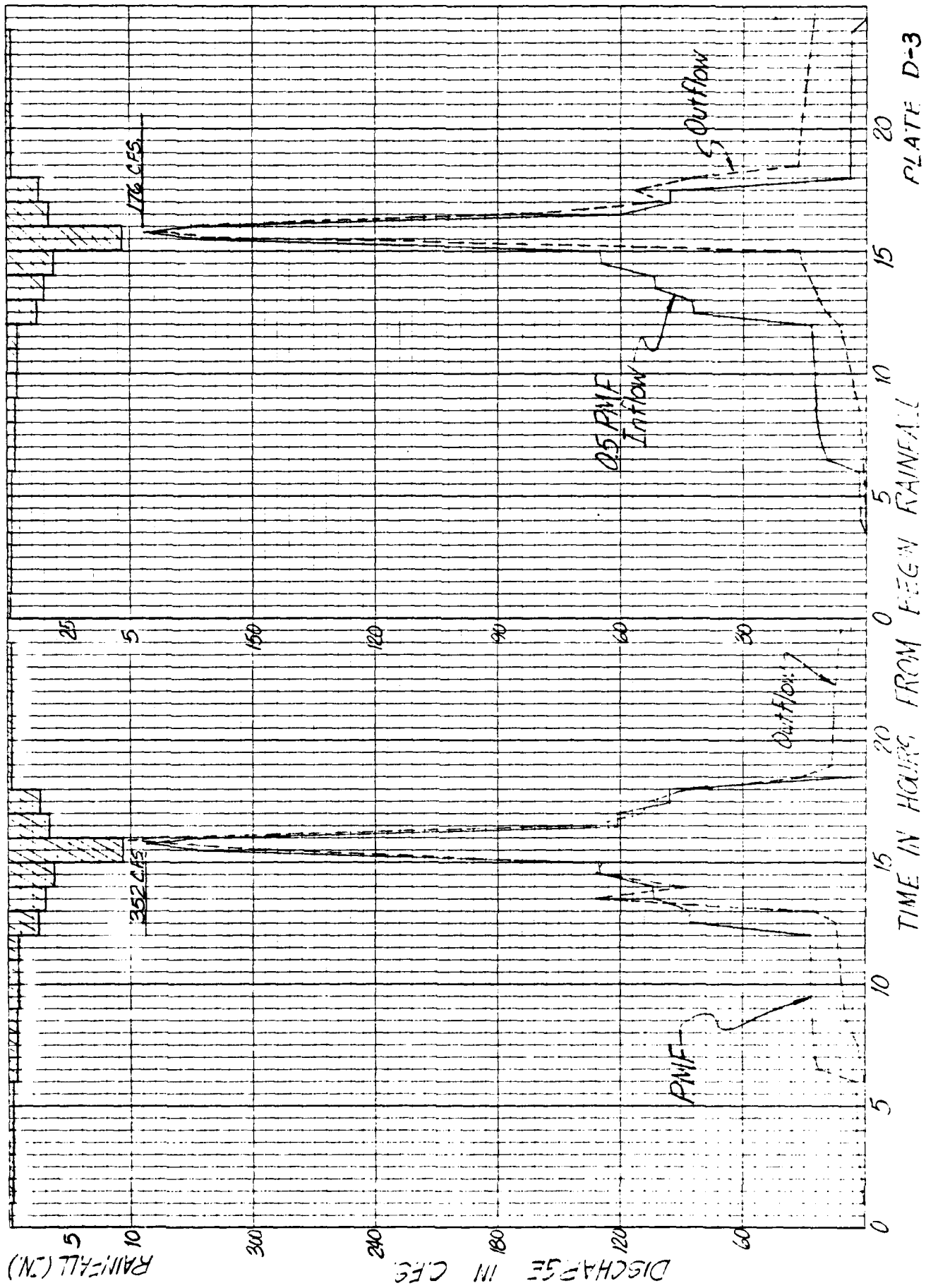
$$Q = a \sqrt{\frac{2gH}{1 + K_e + K_b + K_p L}}$$

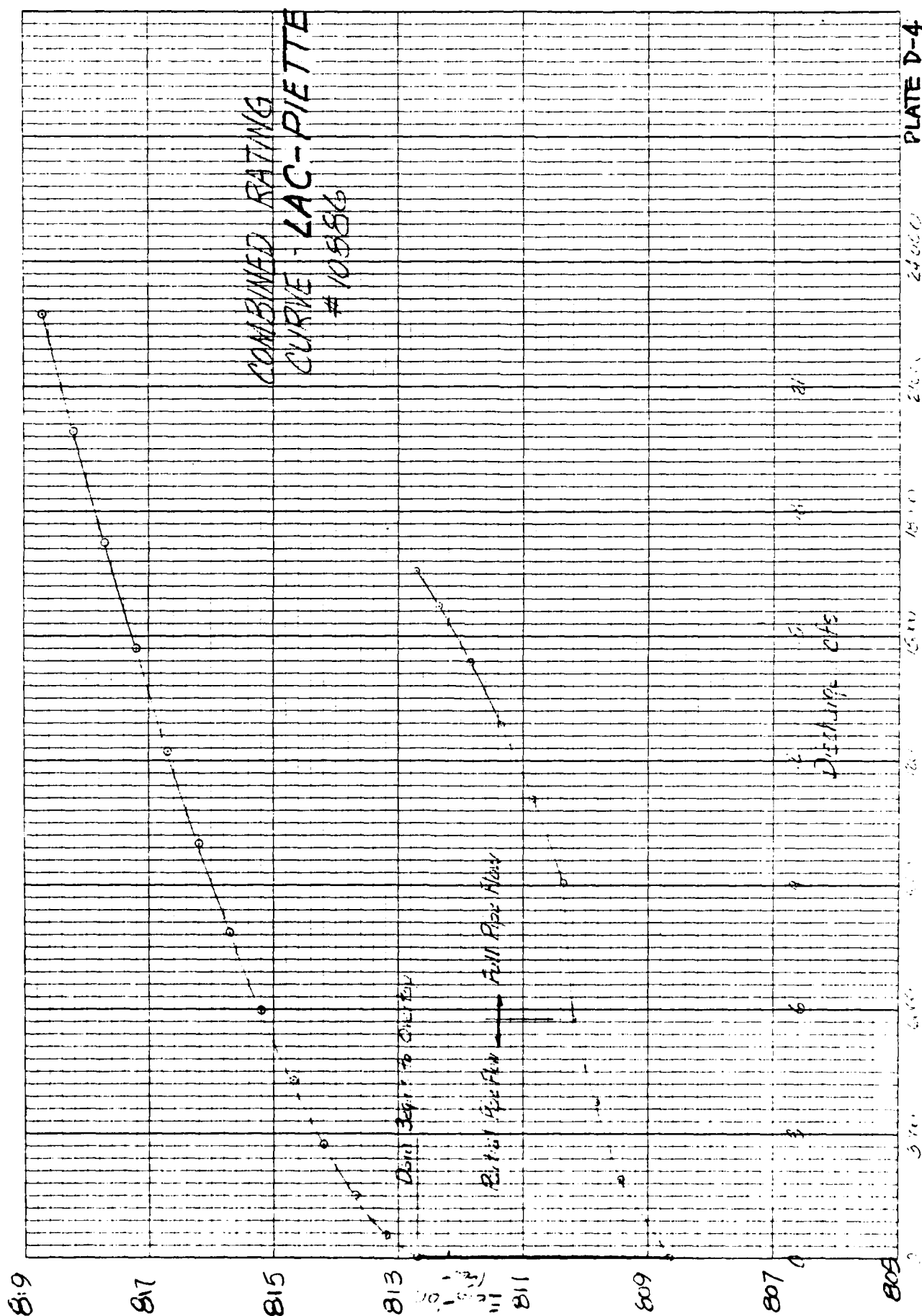
where

| | | |
|----------------|---|--|
| a | = | cross-sectional area of pipe, ft ² = 1.77 |
| H | = | total head, ft. |
| K _e | = | coefficient for entrance loss = 0.5 |
| K _b | = | coefficient for bend loss = 0 |
| K _p | = | coefficient for pipe friction loss = 0.0243 |
| L | = | length of pipe, ft. = 39 |

The flows over the dam are based on the broad-crested weir equation ($Q = CLH^{1.5}$) where H is the head on the dam crest, L is the effective length acting as a weir, and C is an appropriate weir coefficient which varies with head and is based on U.S. Geological Survey criteria.

3. Floods were routed through the spillway using the TR-20 program to determine the capability of the spillway and dam embankment crest. The storm rainfall patterns, inflow hydrographs and routed outflow hydrographs are given on Plate D1.
4. The discrepancy between the PMF inflow and outflow discharges in the tabular data in Section 5 is due to the lack of data available for an accurate stage-storage curve. The power curve method, obtained from information given during the hydrologic/hydraulic standard meeting held on 4 August, 1978 in St. Louis, was used to develop the stage-storage curve used.





HYDROLOGY PROGRAM FOR IAH 1130 - DATED JULY, 1968
LAC-PISTON
NO IAH INSPECTION AND MAINTENANCE FULFILLING NO.
EXECUTIVE CONTROL OPERATION LIST

TR-20 ROUTING.

MO DAM INSPECTION J.D. MACDONALD FULTON MO.

C TABLE

[illegible]

69 5000000

STRUCTURE NO. 1

| ELEVATION | DISCHARGE | STORAGE |
|-----------|-----------|---------|
| 0000 | 0.0000 | 0.0000 |
| 0001 | 0.0000 | 0.0000 |
| 0002 | 0.0000 | 0.0000 |
| 0003 | 0.0000 | 0.0000 |
| 0004 | 0.0000 | 0.0000 |
| 0005 | 0.0000 | 0.0000 |
| 0006 | 0.0000 | 0.0000 |
| 0007 | 0.0000 | 0.0000 |
| 0008 | 0.0000 | 0.0000 |
| 0009 | 0.0000 | 0.0000 |
| 0010 | 0.0000 | 0.0000 |
| 0011 | 0.0000 | 0.0000 |
| 0012 | 0.0000 | 0.0000 |
| 0013 | 0.0000 | 0.0000 |
| 0014 | 0.0000 | 0.0000 |
| 0015 | 0.0000 | 0.0000 |
| 0016 | 0.0000 | 0.0000 |
| 0017 | 0.0000 | 0.0000 |
| 0018 | 0.0000 | 0.0000 |
| 0019 | 0.0000 | 0.0000 |
| 0020 | 0.0000 | 0.0000 |
| 0021 | 0.0000 | 0.0000 |
| 0022 | 0.0000 | 0.0000 |
| 0023 | 0.0000 | 0.0000 |
| 0024 | 0.0000 | 0.0000 |
| 0025 | 0.0000 | 0.0000 |
| 0026 | 0.0000 | 0.0000 |
| 0027 | 0.0000 | 0.0000 |
| 0028 | 0.0000 | 0.0000 |
| 0029 | 0.0000 | 0.0000 |
| 0030 | 0.0000 | 0.0000 |
| 0031 | 0.0000 | 0.0000 |
| 0032 | 0.0000 | 0.0000 |
| 0033 | 0.0000 | 0.0000 |
| 0034 | 0.0000 | 0.0000 |
| 0035 | 0.0000 | 0.0000 |
| 0036 | 0.0000 | 0.0000 |
| 0037 | 0.0000 | 0.0000 |
| 0038 | 0.0000 | 0.0000 |
| 0039 | 0.0000 | 0.0000 |
| 0040 | 0.0000 | 0.0000 |
| 0041 | 0.0000 | 0.0000 |
| 0042 | 0.0000 | 0.0000 |
| 0043 | 0.0000 | 0.0000 |
| 0044 | 0.0000 | 0.0000 |
| 0045 | 0.0000 | 0.0000 |
| 0046 | 0.0000 | 0.0000 |
| 0047 | 0.0000 | 0.0000 |
| 0048 | 0.0000 | 0.0000 |
| 0049 | 0.0000 | 0.0000 |
| 0050 | 0.0000 | 0.0000 |
| 0051 | 0.0000 | 0.0000 |
| 0052 | 0.0000 | 0.0000 |
| 0053 | 0.0000 | 0.0000 |
| 0054 | 0.0000 | 0.0000 |
| 0055 | 0.0000 | 0.0000 |
| 0056 | 0.0000 | 0.0000 |
| 0057 | 0.0000 | 0.0000 |
| 0058 | 0.0000 | 0.0000 |
| 0059 | 0.0000 | 0.0000 |
| 0060 | 0.0000 | 0.0000 |
| 0061 | 0.0000 | 0.0000 |
| 0062 | 0.0000 | 0.0000 |
| 0063 | 0.0000 | 0.0000 |
| 0064 | 0.0000 | 0.0000 |
| 0065 | 0.0000 | 0.0000 |
| 0066 | 0.0000 | 0.0000 |
| 0067 | 0.0000 | 0.0000 |
| 0068 | 0.0000 | 0.0000 |
| 0069 | 0.0000 | 0.0000 |
| 0070 | 0.0000 | 0.0000 |
| 0071 | 0.0000 | 0.0000 |
| 0072 | 0.0000 | 0.0000 |
| 0073 | 0.0000 | 0.0000 |
| 0074 | 0.0000 | 0.0000 |
| 0075 | 0.0000 | 0.0000 |
| 0076 | 0.0000 | 0.0000 |
| 0077 | 0.0000 | 0.0000 |
| 0078 | 0.0000 | 0.0000 |
| 0079 | 0.0000 | 0.0000 |
| 0080 | 0.0000 | 0.0000 |
| 0081 | 0.0000 | 0.0000 |
| 0082 | 0.0000 | 0.0000 |
| 0083 | 0.0000 | 0.0000 |
| 0084 | 0.0000 | 0.0000 |
| 0085 | 0.0000 | 0.0000 |
| 0086 | 0.0000 | 0.0000 |
| 0087 | 0.0000 | 0.0000 |
| 0088 | 0.0000 | 0.0000 |
| 0089 | 0.0000 | 0.0000 |
| 0090 | 0.0000 | 0.0000 |
| 0091 | 0.0000 | 0.0000 |
| 0092 | 0.0000 | 0.0000 |
| 0093 | 0.0000 | 0.0000 |
| 0094 | 0.0000 | 0.0000 |
| 0095 | 0.0000 | 0.0000 |
| 0096 | 0.0000 | 0.0000 |
| 0097 | 0.0000 | 0.0000 |
| 0098 | 0.0000 | 0.0000 |
| 0099 | 0.0000 | 0.0000 |
| 0100 | 0.0000 | 0.0000 |
| 0101 | 0.0000 | 0.0000 |
| 0102 | 0.0000 | 0.0000 |
| 0103 | 0.0000 | 0.0000 |
| 0104 | 0.0000 | 0.0000 |
| 0105 | 0.0000 | 0.0000 |
| 0106 | 0.0000 | 0.0000 |
| 0107 | 0.0000 | 0.0000 |
| 0108 | 0.0000 | 0.0000 |
| 0109 | 0.0000 | 0.0000 |
| 0110 | 0.0000 | 0.0000 |
| 0111 | 0.0000 | 0.0000 |
| 0112 | 0.0000 | 0.0000 |
| 0113 | 0.0000 | 0.0000 |
| 0114 | 0.0000 | 0.0000 |
| 0115 | 0.0000 | 0.0000 |
| 0116 | 0.0000 | 0.0000 |
| 0117 | 0.0000 | 0.0000 |
| 0118 | 0.0000 | 0.0000 |
| 0119 | 0.0000 | 0.0000 |
| 0120 | 0.0000 | 0.0000 |
| 0121 | 0.0000 | 0.0000 |
| 0122 | 0.0000 | 0.0000 |
| 0123 | 0.0000 | 0.0000 |
| 0124 | 0.0000 | 0.0000 |
| 0125 | 0.0000 | 0.0000 |
| 0126 | 0.0000 | 0.0000 |
| 0127 | 0.0000 | 0.0000 |
| 0128 | 0.0000 | 0.0000 |
| 0129 | 0.0000 | 0.0000 |
| 0130 | 0.0000 | 0.0000 |
| 0131 | 0.0000 | 0.0000 |
| 0132 | 0.0000 | 0.0000 |
| 0133 | 0.0000 | 0.0000 |
| 0134 | 0.0000 | 0.0000 |
| 0135 | 0.0000 | 0.0000 |
| 0136 | 0.0000 | 0.0000 |
| 0137 | 0.0000 | 0.0000 |
| 0138 | 0.0000 | 0.0000 |
| 0139 | 0.0000 | 0.0000 |
| 0140 | 0.0000 | 0.0000 |
| 0141 | 0.0000 | 0.0000 |
| 0142 | 0.0000 | 0.0000 |
| 0143 | 0.0000 | 0.0000 |
| 0144 | 0.0000 | 0.0000 |
| 0145 | 0.0000 | 0.0000 |
| 0146 | 0.0000 | 0.0000 |
| 0147 | 0.0000 | 0.0000 |
| 0148 | 0.0000 | 0.0000 |
| 0149 | 0.0000 | 0.0000 |
| 0150 | 0.0000 | 0.0000 |
| 0151 | 0.0000 | 0.0000 |
| 0152 | 0.0000 | 0.0000 |
| 0153 | 0.0000 | 0.0000 |
| 0154 | 0.0000 | 0.0000 |
| 0155 | 0.0000 | 0.0000 |
| 0156 | 0.0000 | 0.0000 |
| 0157 | 0.0000 | 0.0000 |
| 0158 | 0.0000 | 0.0000 |
| 0159 | 0.0000 | 0.0000 |
| 0160 | 0.0000 | 0.0000 |
| 0161 | 0.0000 | 0.0000 |
| 0162 | 0.0000 | 0.0000 |
| 0163 | 0.0000 | 0.0000 |
| 0164 | 0.0000 | 0.0000 |
| 0165 | 0.0000 | 0.0000 |
| 0166 | 0.0000 | 0.0000 |
| 0167 | 0.0000 | 0.0000 |
| 0168 | 0.0000 | 0.0000 |
| 0169 | 0.0000 | 0.0000 |
| 0170 | 0.0000 | 0.0000 |
| 0171 | 0.0000 | 0.0000 |
| 0172 | 0.0000 | 0.0000 |
| 0173 | 0.0000 | 0.0000 |
| 0174 | 0.0000 | 0.0000 |
| 0175 | 0.0000 | 0.0000 |
| 0176 | 0.0000 | 0.0000 |
| 0177 | 0.0000 | 0.0000 |
| 0178 | 0.0000 | 0.0000 |
| 0179 | 0.0000 | 0.0000 |
| 0180 | 0.0000 | 0.0000 |
| 0181 | 0.0000 | 0.0000 |
| 0182 | 0.0000 | 0.0000 |
| 0183 | 0.0000 | 0.0000 |
| 0184 | 0.0000 | 0.0000 |
| 0185 | 0.0000 | 0.0000 |
| 0186 | 0.0000 | 0.0000 |
| 0187 | 0.0000 | 0.0000 |
| 0188 | 0.0000 | 0.0000 |
| 0189 | 0.0000 | 0.0000 |
| 0190 | 0.0000 | 0.0000 |
| 0191 | 0.0000 | 0.0000 |
| 0192 | 0.0000 | 0.0000 |
| 0193 | 0.0000 | 0.0000 |
| 0194 | 0.0000 | 0.0000 |
| 0195 | 0.0000 | 0.0000 |
| 0196 | 0.0000 | 0.0000 |
| 0197 | 0.0000 | 0.0000 |
| 0198 | 0.0000 | 0.0000 |
| 0199 | 0.0000 | 0.0000 |
| 0200 | 0.0000 | 0.0000 |
| 0201 | 0.0000 | 0.0000 |
| 0202 | 0.0000 | 0.0000 |
| 0203 | 0.0000 | 0.0000 |
| 0204 | 0.0000 | 0.0000 |
| 0205 | 0.0000 | 0.0000 |
| 0206 | 0.0000 | 0.0000 |
| 0207 | 0.0000 | 0.0000 |
| 0208 | 0.0000 | 0.0000 |
| 0209 | 0.0000 | 0.0000 |
| 0210 | 0.0000 | 0.0000 |
| 0211 | 0.0000 | 0.0000 |
| 0212 | 0.0000 | 0.0000 |
| 0213 | 0.0000 | 0.0000 |
| 0214 | 0.0000 | 0.0000 |
| 0215 | 0.0000 | 0.0000 |
| 0216 | 0.0000 | 0.0000 |
| 0217 | 0.0000 | 0.0000 |
| 0218 | 0.0000 | 0.0000 |
| 0219 | 0.0000 | 0.0000 |
| 0220 | 0.0000 | 0.0000 |
| 0221 | 0.0000 | 0.0000 |
| 0222 | 0.0000 | 0.0000 |
| 0223 | 0.0000 | 0.0000 |
| 0224 | 0.0000 | 0.0000 |
| 0225 | 0.0000 | 0.0000 |
| 0226 | 0.0000 | 0.0000 |
| 0227 | 0.0000 | 0.0000 |
| 0228 | 0.0000 | 0.0000 |
| 0229 | 0.0000 | 0.0000 |
| 0230 | 0.0000 | 0.0000 |
| 0231 | 0.0000 | 0.0000 |
| 0232 | 0.0000 | 0.0000 |
| 0233 | 0.0000 | 0.0000 |
| 0234 | 0.0000 | 0.0000 |
| 0235 | 0.0000 | 0.0000 |
| 0236 | 0.0000 | 0.0000 |
| 0237 | 0.0000 | 0.0000 |
| 0238 | 0.0000 | 0.0000 |
| 0239 | 0.0000 | 0.0000 |
| 0240 | 0.0000 | 0.0000 |
| 0241 | 0.0000 | 0.0000 |
| 0242 | 0.0000 | 0.0000 |
| 0243 | 0.0000 | 0.0000 |
| 0244 | 0.0000 | 0.0000 |
| 0245 | 0.0000 | 0.0000 |
| 0246 | 0.0000 | 0.0000 |
| 0247 | 0.0000 | 0.0000 |
| 0248 | 0.0000 | 0.0000 |
| 0249 | 0.0000 | 0.0000 |
| 0250 | 0.0000 | 0.0000 |
| 0251 | 0.0000 | 0.0000 |
| 0252 | 0.0000 | 0.0000 |
| 0253 | 0.0000 | 0.0000 |
| 0254 | 0.0000 | 0.0000 |
| 0255 | 0.0000 | 0.0000 |
| 0256 | 0.0000 | 0.0000 |
| 0257 | 0.0000 | 0.0000 |
| 0258 | 0.0000 | 0.0000 |
| 0259 | 0.0000 | 0.0000 |
| 0260 | 0.0000 | 0.0000 |
| 0261 | 0.0000 | 0.0000 |
| 0262 | 0.0000 | 0.0000 |
| 0263 | 0.0000 | 0.0000 |
| 0264 | 0.0000 | 0.0000 |
| 0265 | 0.0000 | 0.0000 |
| 0266 | 0.0000 | 0.0000 |
| 0267 | 0.0000 | 0.0000 |
| 0268 | 0.0000 | 0.0000 |
| 0269 | 0.0000 | 0.0000 |
| 0270 | 0.0000 | 0.0000 |
| 0271 | 0.0000 | 0.0000 |
| 0272 | 0.0000 | 0.0000 |
| 0273 | 0.0000 | 0.0000 |
| 0274 | 0.0000 | 0.0000 |
| 0275 | 0.0000 | 0.0000 |
| 0276 | 0.0000 | 0.0000 |
| 0277 | 0.0000 | 0.0000 |
| 0278 | 0.0000 | 0.0000 |
| 0279 | 0.0000 | 0.0000 |
| 0280 | 0.0000 | 0.0000 |
| 0281 | 0.0000 | 0.0000 |
| 0282 | 0.0000 | 0.0000 |
| 0283 | 0.0000 | 0.0000 |
| 0284 | 0.0000 | 0.0000 |
| 0285 | 0.0000 | 0.0000 |
| 0286 | 0.0000 | 0.0000 |
| 0287 | 0.0000 | 0.0000 |
| 0288 | 0.0000 | 0.0000 |
| 0289 | 0.0000 | 0.0000 |
| 0290 | 0.0000 | 0.0000 |
| 0291 | 0.0000 | 0.0000 |
| 0292 | 0.0000 | 0.0000 |
| 0293 | 0.0000 | 0.0000 |
| 0294 | 0.0000 | 0.0000 |
| 0295 | 0.0000 | 0.0000 |
| 0296 | 0.0000 | 0.0000 |
| 0297 | 0.0000 | 0.0000 |
| 0298 | 0.0000 | 0.0000 |
| 0299 | 0.0000 | 0.0000 |
| 0300 | 0.0000 | 0.0000 |
| 0301 | 0.0000 | 0.0000 |
| 0302 | 0.0000 | 0.0000 |
| 0303 | 0.0000 | 0.0000 |
| 0304 | 0.0000 | 0.0000 |
| 0305 | 0.0000 | 0.0000 |
| 0306 | 0.0000 | 0.0000 |
| 0307 | 0.0000 | 0.0000 |
| 0308 | 0.0000 | 0.0000 |
| 0309 | 0.0000 | 0.0000 |
| 0310 | 0.0000 | 0.0000 |
| 0311 | 0.0000 | 0.0000 |
| 0312 | 0.0000 | 0.0000 |
| 0313 | 0.0000 | 0.0000 |
| 0314 | 0.0000 | 0.0000 |
| 0315 | 0.0000 | 0.0000 |
| 0316 | 0.0000 | 0.0000 |
| 0317 | 0.0000 | 0.0000 |
| 0318 | 0.0000 | 0.0000 |
| 0319 | 0.0000 | 0.0000 |
| 0320 | 0.0000 | 0.0000 |
| 0321 | 0.0000 | 0.0000 |
| 0322 | 0.0000 | 0.0000 |
| 0323 | 0.0000 | 0.0000 |
| 0324 | 0.0000 | 0.0000 |
| 0325 | 0.0000 | 0.0000 |
| 0326 | 0.0000 | 0.0000 |
| 0327 | 0.0000 | 0.0000 |
| 0328 | 0.0000 | 0.0000 |
| 0329 | 0.0000 | 0.0000 |
| 0330 | 0.0000 | 0.0000 |
| 0331 | 0.0000 | 0.0000 |
| 0332 | 0.0000 | 0.0000 |
| 0333 | 0.0000 | 0.0000 |
| 0334 | 0.0000 | 0.0000 |
| 0335 | 0.0000 | 0.0000 |
| 0336 | 0.0000 | 0.0000 |
| 0337 | 0.0000 | 0.0000 |
| 0338 | 0.0000 | 0.0000 |
| 0339 | 0.0000 | 0.0000 |
| 0340 | 0.0000 | 0.0000 |
| 0341 | 0.0000 | 0.0000 |
| 0342 | 0.0000 | 0.0000 |
| 0343 | 0.0000 | 0.0000 |
| 0344 | 0.0000 | 0.0000 |
| 0345 | 0.0000 | 0.0000 |
| 0346 | 0.0000 | 0.0000 |
| 0347 | 0.0000 | 0.0000 |
| 0348 | 0.0000 | 0.0000 |
| 0349 | 0.0000 | 0.0000 |
| 0350 | 0.0000 | 0.0000 |
| 0351 | 0.0000 | 0.0000 |
| 0352 | 0.0000 | 0.0000 |

69 FURTHER

3D DIMENSIONLESS HYDROGRAPH - DELTA T = 484.00

| | | | | |
|--------|--------|--------|--------|--------|
| 0.0000 | 0.0300 | 0.1000 | 0.1900 | 0.3100 |
| 0.0000 | 0.5600 | 0.6200 | 0.9300 | 0.9900 |
| 0.0000 | 0.9900 | 0.9300 | 0.6600 | 0.7800 |
| 0.0000 | 0.5600 | 0.4600 | 0.3700 | 0.3300 |
| 0.0000 | 0.2410 | 0.2070 | 0.1740 | 0.1470 |
| 0.0000 | 0.1070 | 0.0910 | 0.0770 | 0.0660 |
| 0.0000 | 0.0470 | 0.0400 | 0.0340 | 0.0290 |
| 0.0000 | 0.0210 | 0.0180 | 0.0150 | 0.0130 |
| 0.0000 | 0.0090 | 0.0080 | 0.0070 | 0.0060 |
| 0.0000 | 0.0040 | 0.0030 | 0.0020 | 0.0010 |
| 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

69 ENOTW

RAINFALL TIME NO. 1 TIME INCREMENT = 0.50

[illegible]

6.2 Entry

TABLE NO. 2 THE INCREMENT = 0.02

0.0300
0.0400
0.0700
0.1400
0.2700
0.5400
0.8700
1.0000

0.0200
0.0700
0.1400
0.2700
0.5400
0.8700
1.0000

0.0200
0.0600
0.1400
0.2700
0.5400
0.8700
1.0000

0.0100
0.0500
0.1400
0.2700
0.5400
0.8700
1.0000

0.0000
0.0400
0.1400
0.2700
0.5400
0.8700
1.0000

9 FNDIRL

RAINFALL TABLF NO. 3 TIME INCREMENT = 0.50

0.2900
0.6600
1.6700
3.5400
6.8700
10.5400
14.2700
18.0000

0.2100
0.5500
1.2700
2.5400
4.2700
6.5400
9.2700
12.0000

0.1400
0.5100
1.2700
2.5400
4.2700
6.5400
9.2700
12.0000

0.0700
0.4400
1.2700
2.5400
4.2700
6.5400
9.2700
12.0000

0.0000
0.3600
1.2700
2.5400
4.2700
6.5400
9.2700
12.0000

9 FNDIHL

STANDARD CONTROL INSTRUCTIONS

| SUBRIN | KSECTH | SIRCT | HYDROGRAPHIS | DATA NO. 1 | DATA NO. 2 | DATA NO. 3 | OUTPUT OPTIONS |
|--------|--------|-------|--------------|------------|------------|------------|------------------|
| SUBOFF | 0 | 1 | IN1 | 0.053 | 86.000 | 0.120 | PK H C V P H S M |
| RESVOR | 0 | 1 | IN2 | 0.053 | 86.000 | 0.120 | 1 1 1 1 1 1 1 1 |
| ENDATA | 0 | 1 | OUT | 808.700 | 0.000 | 0.000 | 1 1 1 1 1 1 1 1 |

END OF LISTING

EXECUTIVE CONTROL CARD
EXECUTIVE STARTING TIME= 0.00
ALTERNATE NO.= 1

OPERATION INCRLM:
OPERATION COMPUT:
RAIN DEPTH= 1.00
STORM NO.= 1

MAIN TIME INCREMENT= 0.50
FROM XSECTN/STRUCT
RAIN DURATION= 1.00
MAIN TABLE NO.= 3

TO XSECTN/STRUCT
SOIL CONDITION= 3

SUBROUTINE EPIOFF STRUCTURE INPUT
AREA= 0.05
COMPUTED CURVE NO.= 1

TIME OF CONCENTRATION= 0.12
RUNOFF CURVE= 06.0
94.4

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS |
|------------|-----------------|-----------------|
| 3.20 | 3.150 | (RUIOFF) |
| 4.1 | 3.742 | (RUIOFF) |
| 5.07 | 4.139 | (RUIOFF) |
| 10.03 | 26.851 | (RUIOFF) |
| 15.74 | 26.857 | (RUIOFF) |
| 18.94 | 352.450 | (RUIOFF) |
| 19.99 | 8.197 | (RUIOFF) |
| 23.25 | 8.197 | (RUIOFF) |
| | 7.523 | (RUIOFF) |

| TIME | DISCHG | HYDROGRAPH, YZERU= 1.00 | DELTA T= 0.50 | 3.08 | 3.71 | DRAINAGE AREA= 4.12 | 0.05 |
|-------|--------|-------------------------|---------------|-------|--------|---------------------|--------|
| 1.00 | 0.00 | 1.04 | 2.03 | 25.50 | 25.94 | 3.44 | 3.74 |
| 6.00 | 4.51 | 23.32 | 24.46 | 86.39 | 103.79 | 26.08 | 26.25 |
| 11.00 | 26.98 | 120.92 | 120.76 | 94.90 | 103.79 | 129.62 | 130.49 |
| 16.00 | 327.70 | 7.51 | 7.51 | 7.51 | 7.47 | 7.51 | 7.51 |
| 21.00 | 7.51 | | | | | 0.00 | |

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 31.5250 CFS-HRS= 1078.30 ACKE-FI= 89.11

SUBROUTINE RESVOR STRUCTURE 1
SURFACE ELEVATION= 808.70

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS |
|------------|-----------------|-----------------|
| 13.60 | 13.674 | 812.88 |
| 14.72 | 136.107 | 812.88 |
| 15.84 | 361.226 | 813.07 |

| TIME | DISCHG | HYDROGRAPH, YZERU= 1.00 | DELTA T= 0.50 | 0.23 | 0.44 | DRAINAGE AREA= 0.67 | 0.05 |
|-------|--------|-------------------------|---------------|--------|--------|---------------------|--------|
| 1.00 | 0.00 | 0.01 | 0.07 | 808.79 | 808.83 | 0.35 | 0.79 |
| 6.00 | 0.90 | 1.37 | 2.40 | 5.20 | 9.87 | 10.65 | 11.95 |
| 11.00 | 12.52 | 13.03 | 13.49 | 25.10 | 131.26 | 131.65 | 129.02 |
| 16.00 | 348.69 | 111.46 | 111.57 | 89.20 | 131.26 | 131.65 | 129.02 |
| 21.00 | 15.36 | 15.14 | 14.73 | 14.51 | 14.09 | 13.75 | 13.29 |
| 26.00 | 12.36 | 11.80 | 11.42 | 10.41 | 9.90 | 8.50 | 6.48 |
| 31.00 | 5.14 | 4.80 | 4.47 | 3.89 | 3.40 | 3.10 | 2.78 |
| 36.00 | 2.61 | 2.44 | 2.20 | 2.00 | 1.81 | 1.75 | 1.62 |
| 41.00 | 1.57 | 1.51 | 1.46 | 1.35 | 1.26 | 1.21 | 1.13 |
| 46.00 | 1.09 | 1.05 | 1.01 | 0.94 | 0.87 | 0.84 | 0.78 |

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 51.9664 CFS-HRS= 1076.29 ACKE-FI= 88.94

ENDCIP 1

EXECUTIVE CONTROL CARD
STARTING TIME= 0.00
ALTERNATE NO.= 1

OPERATION COMPUT.
RAIN DEPTH= 0.50
STORM NO.= 1

FROM XSECTN/STRUCT
RAIN DURATION= 1.00

IO XSECTN/STRUCT
RAIN TABLE NO.= 3

SOIL CONDITION= 3

SURROUTINE RUNOFF STRUCTURE
AREA= 0.05
COMPUTED CURVE NO.= 1

INPUT RUNOFF CURVE= 06.0
TIME OF CONCENTRATION= 0.12

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS (RUN-OFF) | DELTA T= 0.50 | DRAINAGE AREA= 0.05 |
|------------|-----------------|------------------------------|---------------|---------------------|
| 3.15 | 1.378 | (RUN-OFF) | 1.28 | 11.14 |
| 5.15 | 12.878 | (RUN-OFF) | 13.07 | 13.38 |
| 10.09 | 13.020 | (RUN-OFF) | 163.56 | 42.00 |
| 11.76 | 176.462 | (RUN-OFF) | 163.56 | 47.43 |
| 13.75 | 4.094 | (RUN-OFF) | 3.75 | 47.43 |
| 18.99 | 4.094 | (RUN-OFF) | 3.75 | 47.43 |
| 20.00 | 3.757 | (RUN-OFF) | 3.75 | 47.43 |
| 23.26 | 3.757 | (RUN-OFF) | 3.75 | 47.43 |

| TIME | DISCHG | 0.00 | HYDROGRAPH, TZERO= 3.50 | DELTA T= 0.50 | DRAINAGE AREA= 0.05 |
|-------|--------|-------|-------------------------|---------------|---------------------|
| 3.50 | DISCHG | 11.96 | 1.07 | 1.61 | 11.14 |
| 8.50 | DISCHG | 51.26 | 12.40 | 13.07 | 13.38 |
| 13.50 | DISCHG | 3.75 | 64.96 | 163.56 | 42.00 |
| 18.50 | DISCHG | 3.75 | 4.09 | 163.56 | 47.43 |
| 23.50 | DISCHG | 3.75 | 0.00 | 3.75 | 47.43 |

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 15.4624 CFS-IHRS= 528.88 ACRE-FT= 43.70

SURROUTINE RESVOR STRUCTURE
SURFACE ELEVATIONS= 808.70

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS | DELTA T= 0.50 | DRAINAGE AREA= 0.05 |
|------------|-----------------|-----------------|---------------|---------------------|
| 15.76 | 174.089 | 812.91 | 0.18 | 0.71 |
| 17.41 | 56.287 | 812.76 | 0.77 | 809.12 |

| TIME | DISCHG | 0.00 | HYDROGRAPH, TZERO= 3.50 | DELTA T= 0.50 | DRAINAGE AREA= 0.05 |
|--------|--------|--------|-------------------------|---------------|---------------------|
| 3.50 | DISCHG | 0.01 | 0.01 | 0.14 | 0.37 |
| 8.50 | DISCHG | 808.70 | 0.05 | 0.75 | 808.84 |
| 13.50 | DISCHG | 808.70 | 808.72 | 808.75 | 808.98 |
| 18.50 | DISCHG | 809.55 | 3.04 | 4.26 | 6.31 |
| 23.50 | DISCHG | 809.55 | 809.68 | 809.92 | 10.22 |
| 28.50 | DISCHG | 811.69 | 15.17 | 162.02 | 49.68 |
| 33.50 | DISCHG | 811.69 | 812.16 | 812.90 | 812.75 |
| 38.50 | DISCHG | 16.25 | 15.94 | 15.30 | 14.35 |
| 43.50 | DISCHG | 812.57 | 812.45 | 812.20 | 811.85 |
| 48.50 | DISCHG | 13.02 | 12.62 | 11.66 | 10.16 |
| 53.50 | DISCHG | 811.41 | 811.29 | 811.01 | 810.74 |
| 58.50 | DISCHG | 5.73 | 5.34 | 4.65 | 3.77 |
| 63.50 | DISCHG | 810.19 | 810.12 | 809.99 | 809.83 |
| 68.50 | DISCHG | 2.89 | 2.70 | 2.37 | 1.94 |
| 73.50 | DISCHG | 809.65 | 809.61 | 809.54 | 809.43 |
| 78.50 | DISCHG | 1.72 | 1.66 | 1.49 | 1.33 |
| 83.50 | DISCHG | 809.35 | 809.31 | 809.28 | 809.22 |
| 88.50 | DISCHG | 1.19 | 1.11 | 1.03 | 0.92 |
| 93.50 | DISCHG | 809.17 | 809.14 | 809.10 | 809.06 |
| 98.50 | DISCHG | 0.83 | 0.77 | 0.72 | 0.66 |
| 103.50 | DISCHG | 809.01 | 809.00 | 808.98 | 808.95 |

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 14.9778 CFS-IHRS= 512.31 ACRE-FT= 42.33

ENDRUP 1

END OF JOB
WATCH JOB
JOB NUMBER 70/5095
DATE MAY 2/27/78

TR20
RUN
PHASE 0
AUEUE #24

MU DAM INSPECTION J.D. MACDONALD FULTON MO.

C TABLE

[illegible]

STRUCTURE in. 1

[illegible]

DIFFUSIONLESS HYDROGRAPH - DELTA T = 494.00

| | | | | | |
|---|---------|--------|--------|--------|--------|
| 0 | 0.0000 | 0.0300 | 0.1000 | 0.1300 | 0.3100 |
| 0 | 0.4700 | 0.6600 | 0.8200 | 0.9300 | 0.9900 |
| 1 | 1.0000 | 0.9900 | 0.9300 | 0.8000 | 0.7600 |
| 0 | 0.6000 | 0.5600 | 0.4600 | 0.3900 | 0.3300 |
| 0 | 0.2000 | 0.2410 | 0.2070 | 0.1740 | 0.1470 |
| 0 | 0.12650 | 0.1070 | 0.0910 | 0.0770 | 0.0660 |
| 0 | 0.0650 | 0.0470 | 0.0400 | 0.0340 | 0.0290 |
| 0 | 0.0350 | 0.0210 | 0.0180 | 0.0150 | 0.0130 |
| 0 | 0.0110 | 0.0090 | 0.0080 | 0.0070 | 0.0060 |
| 0 | 0.0050 | 0.0040 | 0.0030 | 0.0020 | 0.0010 |
| 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

62-1613

TIME INCREMENT = 0.50

[illegible]

69 7410744

RAPIDFALL TABLE NO. 2 THE DIFFERENCE = 0.02

STANDARD CONTROL INSTRUCTIONS

| SHRTH | XSECTN | STNCT | HYDROGRAPHIS | DATA NO. 1 | DATA NO. 2 | DATA NO. 3 | OUTPUT | OPTIONS |
|--------|--------|-------|--------------|------------|------------|------------|-----------------|---------|
| RUNOFF | | | INI IN2 OUT | | | | PK II E V PH SM | |
| RESVOR | 0 | 1 | 0 0 6 | 0.053 | 06.000 | 0.120 | 1 1 1 | 1 1 1 |
| EMDATA | 0 | 1 | 6 0 7 | 808.700 | 0.000 | 0.000 | 1 1 1 | 1 1 1 |

END OF LISTING

```

EXECUTIVE CONTROL CARD
EXECUTIVE CONTROL CARD
STARTING TIME= 0.00
ALTERNATE NO.= 1
OPERATION INCR/CM, MAIN TIME INCREMENT= 0.50
OPERATION COMPUT, FROM XSECTN/STRUCT 0/ 1 TO XSECTN/STRUCT 0/ 1
RAIN DEPTH= 1.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 3 SOIL CONDITION= 3
STORM NO.= 1

```

```

SUPROUTINE      RUNOFF      STRUCTURE      INPUT      RUNOFF CURVE=      86.0      TIME OF CONCENTRATION=      0.12
          AKR A=      0.05      INPUT      RUNOFF CURVE NO. =      94.4
          COMPUTED CURVE NO. =

```

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS |
|------------|-----------------|-----------------|
| 9.06 | 1.491 | (RUN OFF) |
| 10.04 | 2.163 | (RUN OFF) |
| 11.03 | 3.353 | (RUN OFF) |
| 15.75 | 7.604 | (RUN OFF) |
| 17.76 | 2.312 | (RUN OFF) |
| 20.00 | 3.391 | (RUN OFF) |
| 20.99 | 3.394 | (RUN OFF) |
| 22.00 | 3.331 | (RUN OFF) |
| 22.00 | 3.395 | (RUN OFF) |
| 23.00 | 3.609 | (RUN OFF) |
| 23.81 | | (RUN OFF) |

| TIME | HYDROGRAPH | YZERO= | DELTA T= | DRAINAGE AREA= |
|-------|------------|--------|----------|----------------|
| 5.30 | 0.00 | 5.50 | 3.75 | 4.17 |
| 10.30 | 4.68 | 3.56 | 16.91 | 20.76 |
| 15.30 | 4.42 | 25.72 | 19.72 | 21.88 |
| 20.30 | 6.59 | 3.39 | 2.72 | 2.71 |
| | 2.72 | | | 3.37 |
| | | | | 0.00 |
| | | | | 0.05 |

| SUBSUPPORTING | RECEIVER | STRUCTURE | ELEVATION |
|---------------|----------|-----------|-----------|
| | | | 1 |
| | | | 808.70 |

| PEAK TIMES | PEAK DISCHARGES | PEAK ELEVATIONS |
|------------|-----------------|-----------------|
| 19.02 | 15.347 | 812.22 |

[illegible]

14-00000

| | Rate |
|------------------|---------|
| 100 OF JOH | 1820 |
| CATCH JOH | |
| JOH WORTH 270000 | PIASE 0 |

Control 6
7.3000
6.6554

DAT
ILM